Gutwin.

# Department of Computer Science
# CMPT 370 Midterm Exam
# October 25, 2000

Total marks: 50 Time: 50 minutes

Your company is building a computer system to control the environment of a house. You have been put in charge of designing the programmable thermostat module. Read the domain information below, and then carry out the following design activities:

A. (10 marks) Create an expanded use case named "add schedule" to represent the typical task example given below. Write the use case using the general format shown in the text.
B. (5 marks) Draw a system sequence diagram for the "add schedule" use case.
C. (15 marks) Write a brief contract for each system operation in your system sequence diagram.
D. (20 marks) Draw a collaboration diagram for each system operation determined in part C. If you use design patterns in your design, indicate them clearly by annotating the diagram.

You will be marked on the correctness of your design artifacts, the clarity and simplicity of your design, and the overall fit of your design to the domain.

**An environmental control system**
Your computer system will control various aspects of a home environment, such as temperature, lighting, security. The system will be controlled by the homeowner, probably using a touch-screen interface mounted into one of the walls of the home. For each module of the system, the homeowner will be able to program the module in order to adjust the controller to the particulars of the homeowner's current needs.

**A programmable thermostat**
The thermostat module controls heating and cooling in the home. The thermostat can automatically adjust the temperature of the home throughout the day based on a daily schedule. In addition, the thermostat can store several named schedules with different control actions, so that the homeowner can choose different schedules for different kinds of days (e.g. weekdays, weekend days, holidays). In a schedule, each control action raises or lowers the temperature to a specific target at a specific time. Schedules repeat until the homeowner chooses a new schedule.

**An example task scenario**
Joan is a homeowner who works from Monday to Thursday, and has Friday to Sunday off. She wants to have the heating in her home correspond to her activities on these two kinds of days. On workdays, Joan wants the house to be warm (22 degrees) from 6:00 AM until 7:00 AM and from 5:30 PM until 11:00 PM; otherwise, the house should be at 18 degrees. On non-workdays, Joan wants the temperature to be 18 degrees from midnight until 9:00 AM, and 22 degrees from 9:00 AM until midnight.

**Initial conceptual model for the domain**
(See over)

**Initial conceptual model for the domain**

An initial domain model has been built by the previous project manager. Note that it is simply the current understanding of the domain, and is not necessarily correct in every detail.